

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

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Satoru ARAKI

Application No.: New U.S. Patent Application

Filed: April 3, 2001

Docket No.: 109164

For: A TUNNEL MAGNETORESISTIVE EFFECTIVE ELEMENT, A THIN FILM
MAGNETIC HEAD, A MAGNETIC HEAD DEVICE AND A MAGNETIC DISK
DRIVE DEVICE

PRELIMINARY AMENDMENT

Director of the U.S. Patent and Trademark Office
Washington, D. C. 20231

Sir:

Prior to initial examination, please amend the above-identified application as follows:

IN THE CLAIMS:

Please replace claims 4, 6-9, 12 and 16 as follows:

4. (Amended) A tunnel magnetoresistive effective element as defined in claim 2, wherein the second conductive layer includes a second electrode/magnetic shielding portion and a second leading electrode portion, and the second electrode/magnetic shielding portion is provided on the other surface of the ferromagnetic tunnel effective film, and the second leading electrode portion is electrically conducted to a part of the second electrode/magnetic shielding portion at a position in which a magnetic field having the same direction as that of the bias magnetic field is generated by a sense current in the second electrode/magnetic shielding portion.

6. (Amended) A tunnel magnetoresistive effective element as defined in claim 4, wherein the first leading electrode portion and the second leading electrode portion are provided in respective different sides from the center line of the ferromagnetic tunnel effective film.

7. (Amended) A tunnel magnetoresistive effective element as defined in claim 4, wherein the first leading electrode portion and the second leading electrode portion are provided in either side from the center line of the ferromagnetic tunnel effective film.

8. (Amended) A tunnel magnetoresistive effective element as defined in claim 6, wherein a planer angle of a line segment to a first center point of a boundary line between the first electrode/magnetic shielding portion and the first leading electrode portion from a center point of the ferromagnetic tunnel effective film for the bias magnetic field direction or a planer angle of a line segment to a second center point of a boundary line between the second electrode/magnetic shielding portion and the second leading electrode portion from the center point of the ferromagnetic tunnel effective film for the bias magnetic field direction is set to 5 degrees or over.

9. (Amended) A tunnel magnetoresistive effective element as defined in claim 1, wherein the magnetic bias means includes a bias magnetic field-inductive layer to apply a given bias magnetic field to the free layer of the ferromagnetic tunnel effective film and a magnetic bias applying means to apply a given magnetic field to the bias magnetic field-inductive layer.

12. (Amended) A thin film magnetic head comprising at least one reading element composed of a tunnel magnetoresistive effective element as defined claim 1.

16. (Amended) A magnetic head device comprising a thin film magnetic head as defined in claim 12 and a head supporting device to support the thin film magnetic head.

REMARKS

Claims 1-17 are pending. By this Preliminary Amendment, claims 4, 6-9, 12 and 16 are amended to eliminate multiple dependencies. Prompt and favorable examination on the merits is respectfully solicited.

The attached Appendix includes marked-up copies of each rewritten claim (37 C.F.R. 1.121(c)(ii)).

Respectfully submitted,



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Attachment:
Appendix

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DEPOSIT ACCOUNT USE AUTHORIZATION Please grant any extension necessary for entry; Charge any fee due to our Deposit Account No. 15-0461
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APPENDIX

Changes to Claims:

The following are marked-up versions of the amended claims:

4. (Amended) A tunnel magnetoresistive effective element as defined in claim 2 ~~or 3~~, wherein the second conductive layer includes a second electrode/magnetic shielding portion and a second leading electrode portion, and the second electrode/magnetic shielding portion is provided on the other surface of the ferromagnetic tunnel effective film, and the second leading electrode portion is electrically conducted to a part of the second electrode/magnetic shielding portion at a position in which a magnetic field having the same direction as that of the bias magnetic field is generated by a sense current in the second electrode/magnetic shielding portion.

6. (Amended) A tunnel magnetoresistive effective element as defined in claim 4 ~~or 5~~, wherein the first leading electrode portion and the second leading electrode portion are provided in respective different sides from the center line of the ferromagnetic tunnel effective film.

7. (Amended) A tunnel magnetoresistive effective element as defined in claim 4 ~~or 5~~, wherein the first leading electrode portion and the second leading electrode portion are provided in either side from the center line of the ferromagnetic tunnel effective film.

8. (Amended) A tunnel magnetoresistive effective element as defined in claim 6 ~~or 7~~, wherein a planer angle of a line segment to a first center point of a boundary line between the first electrode/magnetic shielding portion and the first leading electrode portion from a center point of the ferromagnetic tunnel effective film for the bias magnetic field direction or a planer angle of a line segment to a second

center point of a boundary line between the second electrode/magnetic shielding portion and the second leading electrode portion from the center point of the ferromagnetic tunnel effective film for the bias magnetic field direction is set to 5 degrees or over.

9. (Amended) A tunnel magnetoresistive effective element as defined in ~~any one of claims 1-8,~~ claim 1, wherein the magnetic bias means includes a bias magnetic field-inductive layer to apply a given bias magnetic field to the free layer of the ferromagnetic tunnel effective film and a magnetic bias applying means to apply a given magnetic field to the bias magnetic field-inductive layer.

12. (Amended) A thin film magnetic head comprising at least one reading element composed of a tunnel magnetoresistive effective element as defined in ~~any one of claims 1-11,~~ claim 1.

16. (Amended) A magnetic head device comprising a thin film magnetic head as defined in ~~any one of claims 12-15~~ claim 12 and a head supporting device to support the thin film magnetic head.